

DESIGN SHOWCASE

Regulated charge pump delivers 50mA

The DC-DC converter circuit of Figure 1 substitutes a voltage tripler in place of the external inductor and diode normally associated with switching regulator IC1. Inverting and noninverting drivers in the MOSFET-driver chip (IC2) activate a diode/capacitor tripling network (D1-D3, C1-C3). In comparison with charge pumps based on single-polarity drivers, the buffer/inverter combination of IC2 enables this circuit to deliver more current with fewer parts.

A 50-kHz oscillator within IC1 produces the EXT signal (pin 6), which IC2 converts to drive signals (180° out of phase) for the tripler. The resulting charge-discharge action in the capacitors recharges C3 toward 10V every 20μs. The ferrite bead limits output ripple to about 20mVp-p for a 50-mA load.

Conversion efficiency (Figure 2) is about 70% for the 5V-in, 10V-out configuration shown. You should use low-ESR capacitors and Schottky diodes to assure the 50mA-output capability. Resistors R1 and R2 determine V_{OUT}, which can range as high as 15V with proportionally lower output current:

$$R_1 = R_2[(V_{OUT}/1.31V)-1].$$

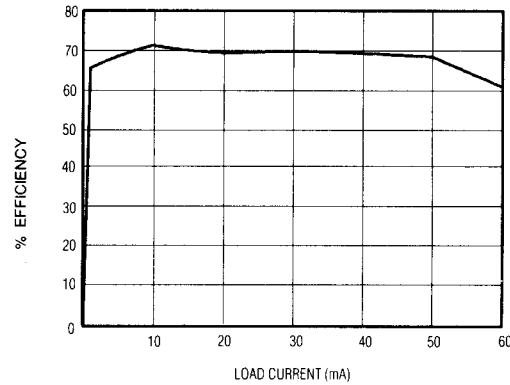


Figure 2. DC-DC conversion efficiency in the Figure 1 circuit varies with load current as shown.

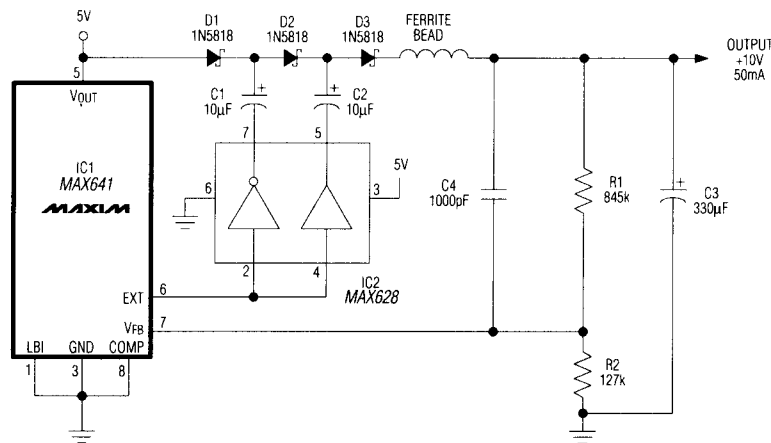


Figure 1. The diode-capacitor tripler network in this step-up switching regulator develops 10V from a 5V input, and delivers 50mA.

(Circle 5)